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BULLETIN

COLLEGE OF ENGINEERING

OHIO NORTHERN UNIVERSITY, ADA, O.

AUG 29 1916

CALENDAR

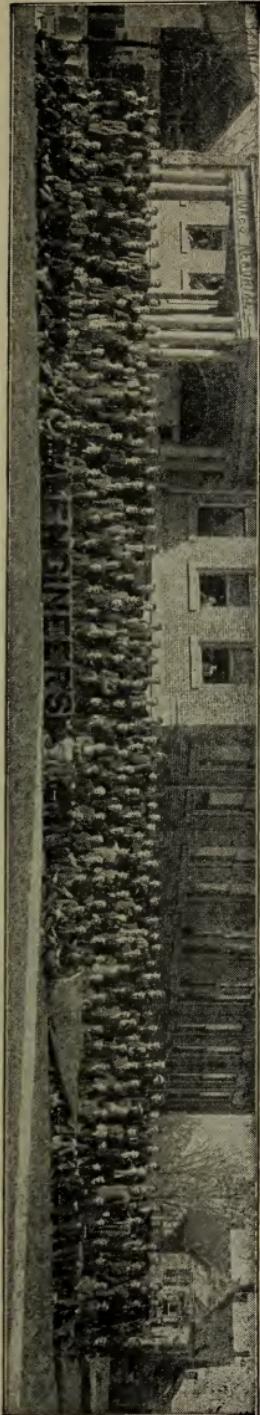
FALL QUARTER, - SEPT. 12, 1916

WINTER QUARTER, DEC. 5, 1916

SPRING QUARTER, MAR. 6, 1917

AN OPPORTUNITY TO SECURE A THOROUGH EDUCATION AT A MINIMUM EXPENSE.



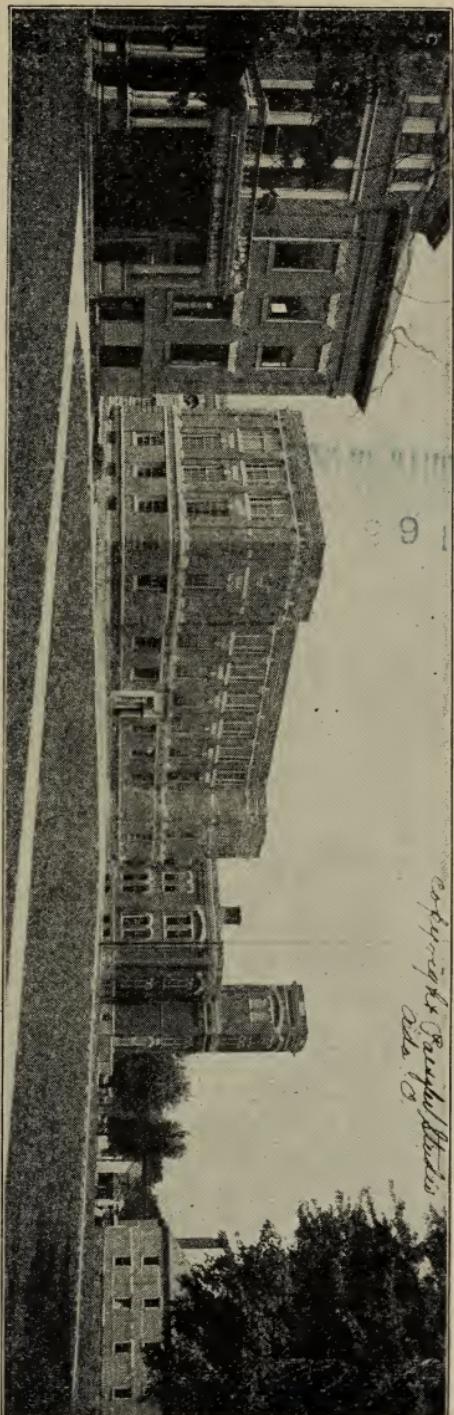


Dukes, "The Engineers' Home".

The New Lehr Memorial.

The Remodeled Hill.

The Brown Gymnasium



COLLEGE OF ENGINEERING

FACULTY

ALBERT EDWIN SMITH, D. D., PH. D.,
President.

CHARLES BYRON WRIGHT, G. S.,
Executive Secretary.

THOMAS JEFFERSON SMULL, ARCH., C. E.,
Dean.
Civil Engineering.

CHARLES ADDISON MILLER, C. E.,
Municipal Engineering.

KARL BOYER MAC EACHRON, E. E.,
Electrical Engineering.

JAMES ALEXANDER CALDERHEAD, B. SC., A. M., C. E.,
Mechanical Engineering.

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Chemical Engineering.

MRS. EVA S. MAGLOTT, A. M., C. E.,
Higher Mathematics.

JOSEPH HAMILTON HILL, C. E.,
Higher Mathematics.

JAMES BRAKES, JR., B. S., in M. E.,
Metallurgy.

FRANK LEWIS BERGER, A. B.,
Physics.

HARVEY EVERETT HUBER, A. M.,
Geology and Mineralogy.

WILLIAM CLAUDIUS GROTH, A. B.,
Modern Languages.

CHILDE HAROLD FREEMAN, B. S.,
English.

WILLIAM HENRY TRAINUM, A. M., B. D.,
Economics.

JAY PAUL TAGGART, LL.B.,
Contracts.

PAUL PINKNEY BREWER, B. S., in C. E.,
Curator of Testing Laboratories.

DAVID B. GERTLER, B. S., in C. E.,
Assistant in Mathematics.

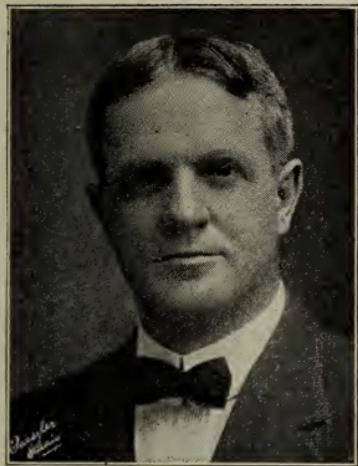
OHIO NORTHERN UNIVERSITY BULLETIN

New Series.

ADA, OHIO, MAY, 1916

VOL. X., NO. 3.

COLLEGE OF ENGINEERING



THOMAS J. SMULL, Dean

the great profession which has been most potent in applying these branches of science to wield the energies of nature and direct them to the service of man has been that of the engineer. Without the engineer, how little of this activity could there have been."—S. P. Thompson, D. Sc., F. R. S.

THIS IS EMPHATICALLY THE PEOPLE'S COLLEGE. Everybody is admitted on the basis of character, without written examination. This school is cosmopolitan. IT IS PRE-EMINENTLY THE SCHOOL FOR THE STUDENT OF MODERATE MEANS. It occupies a unique place among the great educational forces of America, as each student is given large liberty, both with respect to the choice of studies and with respect to the amount of work undertaken. This does not mean that he is left without direction and advice; but it does mean that the student who is fitted physically and mentally to move rapidly with his studies

"We must not delude ourselves by imagining that the happiness and welfare of mankind depend only on its material advancement, or that moral, intellectual and spiritual forces are not in the ultimate resort of greater moment. But if the inquiry be propounded what it is that has made possible this great material progress, there is but one answer that can be given—science. Chemistry, physics, mechanics, mathematics—it is these that have given to man the possibility of organizing this tremendous development; and

is given every opportunity to make the very most of his time. A fine distinction is made, however, between "cramming" and proper assimilation.

In almost every community, in almost every rural district, there are young men (and women also) who are devoting their time to manual labor, who through economy, have laid by a little money. They look about them and observe the advantages of an education. In earlier years they failed to use their opportunities, or what is more frequent, they had no opportunities for obtaining an education. They would now enter some school and begin at the bottom and work up if they were confident that such a school could be found. A school where they would not feel embarrassed by being forced to recite with more educated students.

NO SCHOOL IN AMERICA HAS DONE MORE FOR THIS BACKWARD CLASS THAN OURS. Nor is our attendance confined to local patronage. The New England and Middle States with their rich resources and great demand for engineers, have contributed hundreds of students to our classes; and this is true to somewhat less extent of every state in the UNION, also many have come from FOREIGN LANDS.

The aim of the department is to lay a foundation of sound theory, and at the same time to impart such knowledge of the usual professional practice as shall make its students useful in any position to which they may be called.

Class room and public lectures of special interest to engineers are given from time to time by the leading consulting engineers of this vicinity. Our engineering students are strongly advised to devote their vacations to surveying, drafting, work in factories, repair shops, electric light and railway stations, and similar work, in order to obtain commercial experience and a better appreciation of the relation of technical training to practical work.

THE SUCCESS OF THE COURSE OF TRAINING OFFERED BY THE COLLEGE IS TESTIFIED TO BY THE VERY LARGE PER CENT OF THE GRADUATES WHO ARE ENGAGED IN OCCUPATIONS CONNECTED WITH ENGINEERING.

It May Interest You to Know That

The technical branches are under the direct care of those who have had professional experience as well as a full scientific training.

? ? ? ? ? ? ? ? ? ? ? ?

Are you satisfied with your present position?

Are you making from \$75 to \$300 per month?

Are your chances for advancement satisfactory?

If not, read this circular carefully.

Our Motto

We aim to give students what they want, when they want it.

Expenses

On account of the large number of students attending school at the Ohio Northern University, the cost of living has been reduced to a minimum. Tuition for a term of twelve weeks, \$16.00 Good board in private families can be obtained at prices ranging from \$1.65 to \$2.50 per week, and a well-furnished room at from 75 cents to \$1.00 per week. Ada is a school town, and the majority of the families are engaged in boarding and rooming students. The competition is sharp; hence prices are low and board is good. Everything considered, we do not believe this can be equaled by any school in the United States.

Some schools advertise free tuition, but it will be found that entrance fees with them amount to more than tuition fees here, a fact not to be overlooked by those selecting a school thorough, yet inexpensive.

There is no registration or matriculation fee required.

There is no "breakage fund" fee required.

A nominal fee is required for laboratory and field work, also a small "student activity" fee.

Time to Enter

The large number of classes formed each term makes it possible for a person to enter at almost any time during the year and find the work he wishes. The best time to enter, however, is at the beginning of a quarter. See calendar.

In view of the fact that we present nearly every branch of study in the College of Engineering from two to four times a year, we claim the right to make the above assertion.

NOTE—See general catalogue for further advantages.

Time Required

The object of the founders of the Engineering School of the Ohio Northern University was to provide a school which would

be able to furnish an engineering education with the least possible expenditure of time and money. In looking around for a solution of this problem it was found that about three-eighths of the time allotted to the Engineering Course in other technical schools was devoted to the study of subjects which have no direct bearing upon engineering, and it was found by dropping these subjects the time could be shortened to about two and one-half years.

In this connection we wish to state that we have shortened our courses by throwing out such subjects as French, Greek, German, Zoology, etc., which have no direct bearing on engineering.

By doing this we have placed an engineering degree within reach of thousands of worthy young men whose time and means will not permit them to spend the long period of four years in preparation for a profession.

In thus reducing the length of our courses we have called down upon ourselves the censure of many technical schools throughout the United States who claim a thorough knowledge of engineering can only be obtained by a long college course.

In refutation of this censure permit us to make a comparison of the total number of credit hours required for graduation with those of other technical institutions. As a concrete example we will look at the calendar of one of the most prominent technical schools in the land for the year 1915-16.

Registration days	-----	Monday, Tuesday, Oct. 4, 5
Thanksgiving vacation	-----	Nov. 24 to Nov. 29
Christmas vacation	-----	Dec. 18 to Jan. 4
Easter vacation	-----	Apr. 21 to May 1
Semester examinations close	-----	May 26
School year	-----	32 weeks
Four year course	-----	128 weeks
Class exercises	-----	18½ hrs. per week
Full course	-----	2336 hours
Less 150 hours credit for Thesis	-----	2186

Now let us look at our calendar for the same years.

Registration day	-----	Tuesday, Sept. 7
Christmas vacation	-----	Dec. 18 to Jan. 4
School year closes	-----	Thursday, Aug. 17
School year (actual operation)	-----	48 weeks

Ten quarter course.....	120 weeks
Class exercises.....	20 hrs. per week
Full course (required).....	2400 hours

*All graduates required to prepare a thesis, exclusive of above 2400 hours.

By careful study of above table you will note the first institution requires 2186 hours of actual class work as compared to 2400 hours required by us. Since we have dropped some of the secondary subjects as heretofore mentioned, it is a well-established fact that we give more technical training, hour for hour, than 90 per cent of all other technical schools.

We do not wish to be understood as finding fault with these apparent long courses, which in addition to a thorough scientific training, carry with them the benefits of classical culture; and to accommodate those who may thus wish to broaden their education, the excellent instruction of the Classical and Literary departments of the University are thrown open to all engineering students, free of extra tuition.

Admission

Students presenting certified credits for the subjects required for entrance to the respective courses set forth in the following pages are permitted to register as candidates for the corresponding Engineering degrees. The prerequisites are specifically mentioned in "Description of Courses." Preparatory work may be taken here separately, or in connection with advanced work.
Write for entrance blank.

Admission with Advanced Standing

A liberal policy is pursued in giving credit for work done in other colleges. Some credit is given for practical experience in draughting and field work acquired previous to matriculation, upon a receipt of a satisfactory statement from the employer, stating the nature of the work and length of service. Statements must include POSTOFFICE ADDRESS as well as SIGNATURE OF EMPLOYER.

Options

With the advice and consent of the Professor-in-charge, certain subjects can be elected in the various courses to replace such as may not appeal to the student in his chosen profession. These are termed options, and are found in the schedule of the course.

Degrees

The University is empowered to grant the customary scholastic degrees, which in the College of Engineering, are Bachelor of Science, (B. S.), Civil Engineer (B. S. in C. E.), Mechanical Engineer, (B. S. in M. E.), Electrical Engineer, (B. S. in E. E.), Chemical Engineer (B. S. in Chem. E.) and also those of Municipal Engineer, Sanitary Engineer and Architect, but aims to bestow them on the deserving only. Two years after graduation, upon presentation of a creditable record and approved thesis the regulation degree will be conferred. Such honors are not for sale, but must be earned and merited. The management accepts grades of equal value from other institutions of learning, yet the applicant for a degree is required to do a reasonable portion of his work here. No diploma is granted on grade made wholly in other institutions. No student carrying more than two subjects will be excused from the final examination during the senior term.

Every candidate for a degree must prepare a thesis upon some technical or scientific study, which lies within the field of the degree sought, and may either be designing, construction, testing, or research. The same to be selected with the approval of the Professor-in-charge.

The form of the finished thesis must be in accordance with the requirements of the department and the library.

NO CERTIFICATE OF GRADUATION will be issued less than TWENTY-FOUR WEEKS after announcement of subject or less than FOUR WEEKS after deposit of finished thesis with the Dean.

SEMINAR

Weekly conferences on current engineering events and discussion of engineering papers are held. It shall be the aim of those in charge to have critical study of senior theses made at this time.

STUDENT TECHNICAL ORGANIZATIONS

The Ohio Northern Society of Engineers holds weekly meetings. At the meetings papers are read and discussions given on subjects of interest to all engineering students. A number of addresses by practicing engineers are made before the Society during the school year. All engineering students are eligible to membership in this Society.

The Ohio Northern University Branch of the American Institute of Electrical Engineers holds bi-monthly meetings. At these meetings original papers and papers printed in the Proceedings of the American Institute of Electrical Engineers are read and discussed. All students interested in electrical engineering are eligible to membership in this society. This society enjoyed the distinction of ranking fifth in enrollment among similar organizations at other Colleges and Universities last year.

Students are urged to take an active part in the work of these societies, as the training thus gained forms a most valuable part of their education.

In honor of George Washington, "Surveyor, Soldier, Statesman," the above societies devote a portion of the week of February 21-26 to their "Annual Exhibit," etc.

Among the visiting lecturers of the past year were found Dr. J. A. L. Waddell, America's foremost Bridge Engineer; Daniel B. Luten, designer and patentee of the well known Luten bridges; Harry C. Jordan, Superintendent, U. S. Radio Station, St. Michael's, Alaska; G. I. Armstrong, Electrical Expert, Toledo Rail & Light Co., and others of high standing in the engineering profession.

GOVERNMENT

The University publishes no stereotyped rules of conduct for its patrons. Each student is placed upon his honor. While students are assisted in forming correct habits, this is not a reform school. Persons who cannot govern themselves are not wanted. The opportunities and advantages of the University are offered to all who earnestly desire to develop the best there is in them and wish to fit themselves for usefulness. All are treated as ladies and gentlemen until they prove themselves otherwise. Regular attendance in classes and thoroughness of work is insisted upon. Incorrigible and morally corrupt persons are dismissed from the University.

All students will be received or dismissed at the discretion of the President and Administrative Committee.

1. A student cannot be a candidate for more than one professional degree at the same time.
2. A candidate for a degree must comply with all requirements in force at the time said degree is conferred.
3. A student will be permitted to substitute one subject for

another as outlined under the subject of options.

4. Final examinations will be held on Wednesday and Thursday of the twelfth week of each quarter. Mid-term examinations are also held at the end of the sixth week of each quarter.

5. Special examinations for students debarred or deficient at regular examinations are also held the last Tuesday of each quarter. A fee of \$2.50 for each subject will be exacted.

6. The following method of grading is in effect: A, 90 to 100; B, 80 to 90; C, 70 to 80; D, 60 to 70; E, Failure.

7. Any student being given a grade D will be "conditioned" and be required to take the next regular examination in that subject. In case the subject is not repeated during the school year he will be given the opportunity of a special examination as provided under Section 5.

8. Failing to pass the second examination or having received a grade E at the first examination, he must repeat the subject with the next class. Failing a third time under the first condition, or the second time under the second condition to pass a satisfactory examination, he shall be dropped from the roll of the school.

9. Before entering on any study the student must give the instructor satisfactory evidence that he is prepared to pursue it with advantage.

10. The Dean requires a student to drop a part of his work at any time, if in his opinion he is undertaking too much; or to take additional work, if he thinks he is not sufficiently employed.

11. No credit will be allowed a student for work in any course, unless the election of the work is formally entered on his classification blank before the work is done.

12. After matriculation a student can not without special permission of the Dean be admitted to examination in any one of the courses given, until he has received in the University the regular instruction in such course.

13. Fifteen recitation hours per week is the minimum permitted, while twenty-three is the maximum permitted. Should the Dean grant the privilege to carry more hours it will be accompanied by Extra Tuition.

Student Help

The Board of Education of the M. E. Church lends money

to those who are taking a course in school and have been in attendance long enough to merit a recommendation from the faculty. No interest is charged for two years from date of graduation, and no security is required further than a recommendation from a quarterly conference and from the faculty. Many of our best students avail themselves of this advantage.

For further information, address Prof. H. Whitworth, Ada, Ohio, who has charge of this fund.

There is also an Employment Bureau conducted by the Y. M. C. A., whereby many of our students make their entire expenses working as waiters, janitors, and other occupations in town and nearby, being able at the same time to carry on their studies in full work. There is no reason why any ambitious and capable young man or woman desiring an education, should not obtain it at the Ohio Northern University.

24 Reasons Why

1. Because students can enter at any time and find what they want.
2. Because the University receives students of all grades of scholarship.
3. Because all her instructors are specialists in their line.
4. Because her instructors are kind and sympathetic, and make the welfare of the student of first importance.
5. Because her instructors do not lecture two or three times a week and turn their classes over to an assistant instructor (or in some cases a member of the senior class) for quiz work and grading, which is so prevalent in most technical schools.
6. Because her instructors spend from four to six hours each day in the class room, assisting each student in the analysis of every detail of the subject, thus bringing to them an opportunity for advancement afforded by no other method and by few other schools.
7. Because of the wonderful enthusiasm everywhere manifested in recitation room and out.
8. Because the work is practical and fits young men and women to "do things."
9. Because she offers thorough work in many special lines.
10. Because she invites inspection as to the work done and guarantees what she advertises.

11. Because expenses are low—so low that many find it cheaper to go to school here than to stay at home.
12. Because nowhere else can so much be gotten for so little money.
13. Because the school is the friend of the poor boys and girls, and furnishes them an opportunity to get an education they could not otherwise obtain.
14. Because of the strong intellectual and social environment felt everywhere within her walls and in the town.
15. Because of healthy moral and religious life felt throughout the school and town.
16. Because the citizens of the town take deep interest in the students and try to make their stay pleasant.
17. Because the student can take just such studies as he needs and is not confined to a special curriculum of studies.
18. Because where the student is compelled to drop out of school for any reason, he does not lose his standing in his classes, as all grades are recorded on our books, and the student having earned them, may take them elsewhere, or he may re-enter at any time and begin where he left off, and complete his course of study.
19. Because the town is healthy and free from the vices so common in the larger cities.
20. Because the students room and board in private families and the home life is not sacrificed by rooming in dormitories.
21. Because every student is treated as a gentleman or lady. They are placed upon their honor.
22. Because our students know the true worth of hard, honest work. Lazy students are not countenanced.
23. Because our students are satisfied with the work of the University and work for her. They are our best advertisements and our best advertisers.
24. Because the country has come to recognize the character of the instruction given here and the demands for our graduates to fill places of trust, honor and profit is greater than the supply.

CIVIL ENGINEERING



PROF. CHAS A. MILLER

ing, strength of materials, roofs, bridges, foundations, arches, retaining walls, dams, waterworks, river and harbor improvements, sewerage, drainage, hydraulics, waterpower and geodesy.

The method of teaching is by means of class room exercises, field work, practical drawing and designing. Much time is devoted to the study of steel and concrete construction, during which the student is made familiar with the computation of stresses, designing, detailing and drawing of roofs, bridges and steel and concrete construction of all kinds. The subjects of Roads and Pavements, Railroad Construction and Maintenance, and Masonry Construction are exhaustively treated. Special attention is given to land, Topographical, Stadia and City Surveying and Leveling. We aim to fit men to act as county and city engineers, surveyors, railroad engineers, bridge engineers, structural engineers, hydraulic engineers and government geodetic engineers.

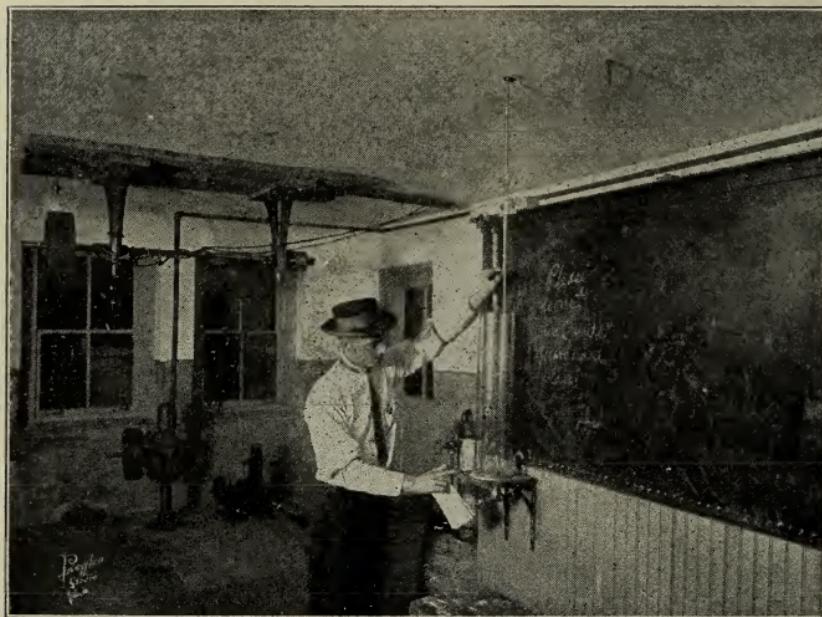
Besides the regular undergraduate work, special and more elaborate work will be given to those wishing to prepare for special positions.

PRACTICALLY ALL LOCAL IMPROVEMENTS ARE UNDER THE DIRECT SUPERVISION OF THE COLLEGE OF ENGINEERING. Many thousands of dollars have been expended the past few years for street paving, macadamizing, sewerage, etc., the major portion of the engineering work being done by the students themselves. During the present year an extensive sewer system,

together with considerable street improvement is being projected, and will thus give the student an opportunity of getting an insight into real engineering practice, which combined with theoretical instruction presents unexcelled opportunity for advancement.

Equipment

Our equipment is second to none being composed of high-grade transits, levels, sextant, solar compasses, plane tables, hand levels, aneroid barometers, stadia outfits, sight poles, level rods, chains, tapes, axes, pins, railroad curves, planimeters, protractors, stereotomy and descriptive geometry models, a collection of photographs and shop drawings of bridges and buildings, a large modern draughting room, equipped with individual



HYDRAULIC LABORATORY

lockers, hydraulic, cement and testing laboratories, a complete blue printing outfit and filing cases by which the student is familiarized with modern office methods, projectoscope and numerous engineering slides, and an excellent scientific library. This equipment is constantly being added to by purchase and do-

nation and by construction of students of the College of Engineering.

The following is a schedule of the course offered, showing the number of credit hours per week devoted to each subject:

Schedule

FIRST QUARTER

	Hours
College Algebra I.....	4
Trigonometry I.....	5
Mechanical Drawing I	4
Chemistry II.....	5
Business English.....	4

SECOND QUARTER

College Algebra II.....	4
Trigonometry II.....	2½
Mechanical Drawing II.....	4
Chemistry III.....	5
Analytical Geometry I.....	4

THIRD QUARTER

College Algebra III.....	4
Calculus I.....	4
Mechanical Drawing III	4
Analytical Geometry II.....	4
Physics VI.....	5
.....

FOURTH QUARTER

Geology.....	3
Calculus II.....	4
Descriptive Geometry I.....	4
Plane Surveying.....	5
Physics IV.....	5
.....

FIFTH QUARTER

Analytical Mechanics.....	5
Calculus III	5
Descriptive Geometry II.....	4
Field Engineering	5
Physics V	4
.....

OPTIONS.

Machine Design, 4; Metallurgy, 2½; Mineralogy, 2½; Water Supply, 4; Electrical Machinery I., 5; Sewer Design, 2½; Advanced English or Advanced German or other modern languages, 8.

Note—200 credit hours required for graduation.

Note—Two hours field work constitutes one credit hour.

Maximum number of hours per week—23.

Minimum number of hours per week—15.

SIXTH QUARTER

	Hours
Astronomy	4
Mechanics of Materials I	5
Masonry.....	4
Highway Engineering	2½
Rail Road Surveying.....	5

SEVENTH QUARTER

Field Astronomy.....	2½
Mechanics of Materials II.....	5
Stresses I.....	5
Graphics 1	4
R. R. Economics and Design.....	5

EIGHTH QUARTER

Stresses II	5
Graphics II	4
Masonry Design.....	3
Electric Railways.....	2½
Sewerage.....	2½
Least Squares.....	2½

NINTH QUARTER

Bridge Design I	5
Hydraulics I	5
Higher Structures	5
Reinforced Concrete	3
Geodesy	2½
Cement Testing	1

TENTH QUARTER

Bridge Design II	5
Hydraulics II	4
Hydraulic Laboratory	2½
Building Construction	3
Estimates and Contracts	2½
Seminar	1
THESIS	

ELECTRICAL ENGINEERING



PROF K.B.MCEACHERON

The courses offered in this branch of Engineering require a thorough study of theoretical and applied electricity. The first half of the prescribed study is, in the main, the same as that in the Civil and Mechanical Engineering curriculum, including the fundamental engineering sciences, mathematics, drawing and surveying.

The first half consist of courses of study in stresses, graphics, strength of materials, hydraulics, steam engines, advanced study in the theory of electricity, a large amount of laboratory research and experiment, shop tests, plant testing, meter testing, machine drafting and designing, power plant and wiring layouts, and a thorough course in electrical machine construction.

The theoretical work is thoroughly supplemented with practical application in the laboratory and in the design of electrical machinery. Throughout the course the student is drilled in the solution of many numerical problems with a view to a firm grasp of the theory.

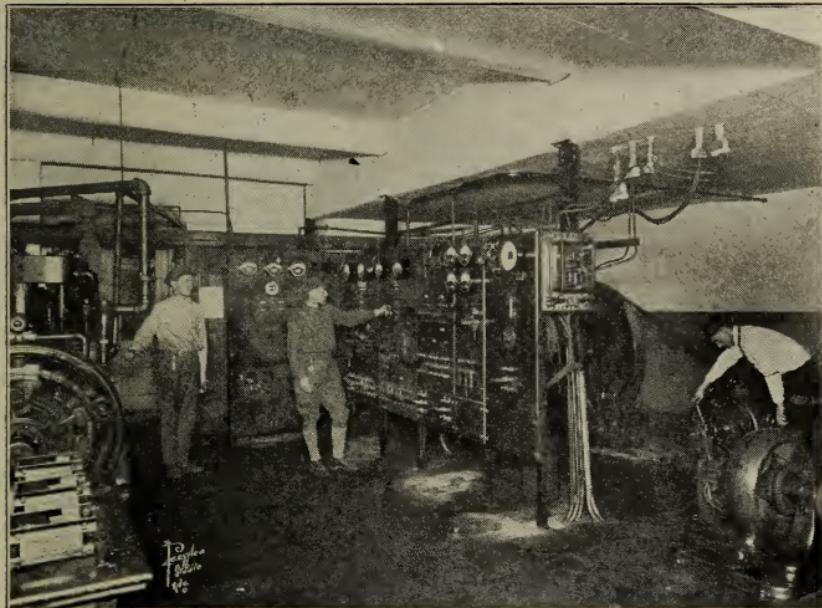
Equipment

In addition to an excellent Physical Laboratory, the department has a well equipped Electrical Laboratory. An up-to-date gas engine driven Electric lighting system has been installed for lighting the University buildings and grounds, and for driving the ventilating motors in the various buildings. Both this plant and the plant of the Ada Water, Heat & Light Company are available for inspection and test by the students.

The University power plant comprises two gas engine units, one direct connected and the other belt connected. To prevent interruption to the service, storage batteries have been installed. These batteries are available for test and form an important addition to the laboratory equipment.

In the laboratory, both direct and alternating currents may be used for testing purposes. During the past year the many additions made to the laboratory equipment, and the enlargement of the

laboratory, has made it possible to accommodate a large number of students. In addition to the machine shop with its complement of lathes and drill presses and other tools constitute a valuable acquisition for the department. As a part of the electrical equipment the following may be mentioned: A General Electric three phase generator arranged with two sets of winding so as to supply either three phase alternating current or direct current; a control panel with suitable switches and circuit breakers, meters, etc.; a testing panel for the measuring of resistance or testing of three phase apparatus, a feeder panel for the control of the A. C. and D. C. testing circuits, a five panel switchboard for controlling the D. C. generators, motor generators,



ELECTRICAL LABORATORY

sets and storage batteries, equipped with necessary meters, switches, circuit breakers, etc.; a large number of D. C. motors and generators representing the product of seven different manufacturing companies, including an interpole motor of the latest construction; several transformers; Westinghouse, Wagner and Emerson induction motors, both three phase and single phase; complete wireless outfit; induction coils; storage batteries of

several different types; X-Ray apparatus; frequency meters; galvanometers; bridges; rheostats; watt-hour meters; prony-brakes and about forty voltmeters, ammeters and wattmeters, representing nearly all the best known makes of instruments. In addition to the above, the department has recently acquired two different current generators, a twenty-five K. W. General Electric and a fifteen K. W. Westinghouse. The department is well supplied with all the necessary equipment for the conducting of first class laboratory work.

The following is a schedule of the course offered, showing the number of credit hours per week devoted to each subject:

Schedule

FIRST QUARTER		SIXTH QUARTER	
College Algebra I.....	4	Electrical Machinery V.....	5
Trigonometry I.....	5	Electrical Machinery III.....	4
Mechanical Drawing I.....	4	Gas Engines.....	4
Chemistry II.....	5	Mechanics of Materials I.....	5
Business English	4	Machine Drawing.....	4
SECOND QUARTER		SEVENTH QUARTER	
College Algebra II.....	4	Electric Machinery VI.....	4
Trigonometry II.....	2½	Electric Machinery IV.....	4
Mechanical Drawing II.....	4	Mechanics of Materials II.....	5
Chemistry III.....	5	Machine Design I.....	4
Analytical Geometry I.....	4	Hydraulics I.....	5
THIRD QUARTER		EIGHTH QUARTER	
College Algebra III.....	4	Electric Machinery VII.....	5
Calculus I.....	4	Stresses I.....	5
Mechanical Drawing III.....	4	Graphics I.....	4
Analytical Geometry II.....	4	Machine Design II.....	4
Physics VI	5	Hydraulics II.....	4
FOURTH QUARTER		NINTH QUARTER	
Electrical Machinery I.....	5	Electric Machinery VIII.....	4
Calculus II.....	4	Electric Machinery IX.....	4
Descriptive Geometry I.....	4	Masonry.....	4
Plane Surveying.....	5	Electric Railways.....	2½
Physics IV	5	Hydraulic Laboratory.....	2½
		Seminar	1
FIFTH QUARTER		TENTH QUARTER	
Electrical Machinery II.....	4	Advanced Alternating Curr'ts.....	5
Descriptive Geometry II.....	4	Electrical Transmission.....	4
Calculus III.....	5	Illuminating Engineering.....	4
Analytical Mech.....	5	Est. and Contracts.....	2½
Physics V.....	4	Seminar	1
THESES			

Note—200 hours are required for graduation.

Note—Two hours laboratory work constitutes one credit hour.

Maximum number of hours per week—23.

Minimum number of hours per week—15.

OPTIONS

Descriptive Geometry, 4; Electric Meters, 4; Storage Batteries, 4; Telephone Engineering, 4; Metallurgy, 2½; Railroad Engineering, 5; Gas Engines, 5: Adv. A. C. Lab., 2½; Differential Equations, 4; Adv. Eng. or Adv. German or other modern languages, 8.

OHIO NORTHERN UNIVERSITY

MECHANICAL ENGINEERING



PROF. J. A. CALDERHEAD

Mechanical Engineering deals with the transformation and transmission of energy, and with the theory and construction of mechanism and machinery. The courses offered are selected with a view to the theoretical and practical training that will enable the student to cope with the intricate and complicated problems arising in this phase of engineering. The first half of the curriculum consists of the basic engineering studies. In the latter half the usual mechanical engineering studies are pursued.

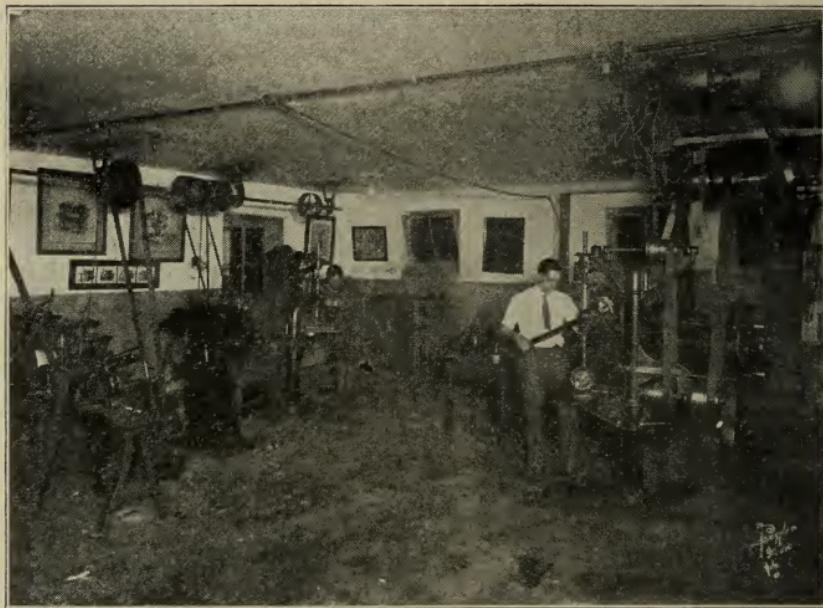
Thorough training is given in machine drafting, machine designs, thermodynamics, steam engines, steam boilers, gas engines, electrical machinery, and steam power plants.

Equipment

The University has its own gas-engine-driven lighting plant and a central steam heating plant, lighting and heating all the University buildings. This equipment is installed with special convenience for making tests on boilers, heating apparatus and power apparatus. In addition the central heating and lighting plant of the Ada Heating and Light Co., with its equipment of Corliss engines, high pressure cold and hot water pumps, et cetera, is open to the students for inspection and test.

A well equipped machine shop has been added recently to the laboratory equipment, thus giving the student excellent training in this important phase of the mechanical engineering.

The mechanical laboratory is equipped with several small steam engines and with gas engines ranging in size from one-half H. P. up to a three cylinder 35 H. P. unit. The department has for use in the laboratory the usual instruments necessary for conducting tests, such as steam indicators calorimeters, draft gages, thermometers, flow meters, pressure and vacuum gages, prony brakes, etc.



MECHANICAL LABORATORY

The following is a schedule of the course, showing the number of credit hours per week devoted to each subject:

Schedule

FIRST QUARTER	Hours	FIFTH QUARTER	Hours
College Algebra I.....	4	Calculus III	5
Trigonometry I.....	5	Electrical Machinery III.....	4
Mechanical Drawing I.....	4	Analytical Mechanics.....	5
Chemistry II.....	5	Descriptive Geometry II.....	4
Business English.....	4	Physics V	4

SECOND QUARTER	Hours	SIXTH QUARTER	Hours
College Algebra II.....	4	Thermodynamics I.....	4
Trigonometry II.....	2½	Mechanics of Materials I.....	5
Mechanical Drawing II.....	4	Machine Drawing.....	4
Chemistry III.....	5	Metallurgy.....	2½
Analytical Geometry I.....	4	Plane Surveying.....	4

THIRD QUARTER	Hours	SEVENTH QUARTER	Hours
College Algebra III.....	4	Thermodynamics II	5
Calculus I	4	Mechanics of Materials II	5
Mechanical Drawing III.....	4	Machine Design I.....	4
Analytical Geometry II.....	4	Mechanical Laboratory I.....	5
Physics VI.....	5	Hydraulics I	5

FOURTH QUARTER	Hours	EIGHTH QUARTER	Hours
Electrical Machinery I	5	Machine Design II	4
Calculus II	4	Stresses I.....	5
Descriptive Geometry I.....	4	Graphics I	4
Organic Chemistry.....	5	Hydraulics II	4
Physics IV	5	Gas Engines.....	5

NINTH QUARTER		TENTH QUARTER	
	Hours		Hours
Gas Engine Design.....	4	Steam Power Plants.....	4
Mechanical Laboratory II.....	4	Mill Buildings	3
Stresses II.....	5	Scientific Management	4
Steam Turbines	5	Hydraulic Laboratory	2½
Seminar.....	5	Estimates and Contracts	2½
		Seminar	1
		THESIS	

OPTIONS

Reinforced Concrete, 3; Heating and Ventilation, 4; Steam Piping System, 4; Masonry, 4; Producer Gas and Gas Producer, 4; Advanced English. Advanced German or other modern languages, 8.

MUNICIPAL AND SANITARY ENGINEERING

This branch of engineering is probably more nearly related than any other to the parent stem, civil engineering. The instruction consists of the basic engineering sciences, and most of the general civil engineering subjects, special attention being

**CEMENT LABORATORY**

paid to those branches which have to do with the public health. This calls for a better knowledge of chemistry, bacteriology and sanitation than can be obtained in the usual courses in civil engineering, and additional work is given in topographic surveying, water supply, sewer design, sewage disposal, roads and pavements and precise surveying.

At no time in the history of all countries has there been a greater demand for improved highways. Comparatively few men of this country have given the matter of highway construc-

tion the study which the subject deserves and it naturally follows that there is a great demand for men trained in the art of road building.

City improvement mentioned in another article affords a splendid opportunity to those following this course of study. A few of the many essential features which we might mention, i. e., establishing street and sidewalk grades, cross-sectioning and computing earthwork, laying out street and alley intersections, installation of sewers and accessories, inspection, specifications, advertisements, proposals and lettings,

The following is the schedule of the course offered showing the number of credit hours per week devoted to each subject.

Schedule

FIRST QUARTER		SIXTH QUARTER	
	Hours		Hours
College Algebra I.....	4	Water Analysis.....	5
Trigonometry I.....	5	Mechanics of Materials I.....	5
Mechanical Drawing I.....	4	Highway Engineering.....	2½
Chemistry II.....	5	Railroad Surveying.....	5
Business English.....	4	Physics VI.....	5

SECOND QUARTER		SEVENTH QUARTER	
	Hours		Hours
College Algebra II.....	4	Masonry	4
Trigonometry II.....	2½	Mechanics of Materials II.....	5
Mechanical Drawing II.....	4	Stresses I.....	5
Chemistry III.....	5	Graphics I	4
Analytical Geometry I.....	4	R. R. Economics and Design.....	5

THIRD QUARTER		EIGHTH QUARTER	
	Hours		Hours
College Algebra III.....	4	Stresses II.....	5
Calculus I.....	4	Graphics II.....	4
Mechanical Drawing III.....	4	Masonry Design.....	3
Analytical Geometry II.....	4	Electric Transmission.....	4
Chemistry VI.....	5	Sewerage Disposal.....	2½
.....	.....	Sewerage Design.....	2½

FOURTH QUARTER		NINTH QUARTER	
	Hours		Hours
Geology	3	Water Supply.....	4
Calculus II.....	4	Hydraulics I.....	5
Descriptive Geometry I.....	4	Higher Structures.....	5
Plane Surveying.....	5	Reinforced Concrete.....	3
Physics IV.....	5	Irrigation	2½
.....	.....	Electric Railways.....	2½

FIFTH QUARTER		TENTH QUARTER	
	Hours		Hours
Analytical Mechanics	5	Municipal Management.....	4
Calculus III.....	5	Hydraulics II.....	4
Descriptive Geometry II.....	4	Hydraulic Laboratory	2½
Municipal Engineering.....	5	Building Construction.....	3
Physics V.....	4	Estimates and Contracts.....	2½
.....	.....	Cement Testing.....	1
.....	.....	Seminar	1
.....	.....	THESIS	

Note—200 hours are required for graduation.

Note—Two hours laboratory work constitute one credit hour.

Maximum number of hours per week—23.

Minimum number of hours per week—15

CHEMICAL ENGINEERING

In answer to the growing demand for a course of study that will prepare the student to attack and solve the many chemical and metallurgical problems evolving from the rapid development of the industries, a course in chemical engineering has been arranged. The aim is not only thoroughly to acquaint the student with the fundamental principles of chemical science, but to afford him a complete drill in analysis and in the preparation of inorganic and organic products.

Schedule

FIRST QUARTER	Hours	SIXTH QUARTER	Hours
College Algebra I.....	4	Mechanics of Materials II.....	5
Trigonometry I	5	Machine Design I.....	4
Mechanical Drawing I.....	4	Electric Machines II.....	4
Chemistry II.....	5	Organic Chemistry I.....	5
Business English.....	4	Thermodynamics I.....	5
SECOND QUARTER		SEVENTH QUARTER	
College Algebra II.....	4	Mechanics of Materials II.....	5
Trigonometry II.....	2½	Mechanical Laboratory I.....	4
Mechanical Drawing II.....	4	General Metallurgy.....	2½
Chemistry III.....	5	Organic Chemistry II.....	5
Analytical Geometry I.....	4	Thermodynamics II.....	5
THIRD QUARTER		EIGHTH QUARTER	
College Algebra III.....	4	Graphics I.....	4
Calculus I.....	4	Steam Engines.....	4
Mechanical Drawing III.....	4	Electric Machines V.....	5
Analytical Geometry II.....	4	Quantitative Analysis I.....	5
Physics IV.....	5	Electro Metallurgy.....	2½
FOURTH QUARTER		NINTH QUARTER	
Calculus II.....	4	Hydraulics I.....	5
Descriptive Geometry I.....	4	Economics.....	5
Elem. Elect. Engineering	5	Electric Laboratory I.....	4
Qualitative Analysis I.....	5	Special Chemistry.....	5
Physics VI.....	5	Estimates and Contracts.....	2½
FIFTH QUARTER		TENTH QUARTER	
Calculus III.....	5	Hydraulics II.....	5
Descriptive Geometry II.....	4	Scientific Management.....	4
Electrical Machinery I.....	5	Storage Batteries.....	4
Qualitative Analysis II.....	5	Industrial Chemistry.....	5
Physics V.....	4	Seminar	1
		THESIS	

Note—200 hours are required for graduation.

Note—Two hours laboratory work constitutes one credit hour.

Maximum number of hours per week—23.

Minimum number of hours per week—15.

STRUCTURAL DRAFTING

This course is designed to give the students a thorough drill in "Drafting Room" practice. There are many young men who for reasons, financial or otherwise, do not aspire to the longer courses leading to a degree, but who would gladly avail themselves of the opportunity to prepare themselves to enter the busy "Structural Field." For such as these we have arranged this course, and upon completion of same a certificate will be granted, which should prove to be a valuable passport into the modern drafting room. There is no preparation other than the grades necessary to enter this course.

Schedule

FIRST QUARTER		THIRD QUARTER	
Algebra I.....	4	Algebra III.....	4
English Composition.....	5	Geometry III.....	5
Mechanical Drawing I.....	4	Mechanical Drawing III.....	4
Geometry I.....	5	Descriptive Geometry I.....	4
		Business English.....	4
SECOND QUARTER		FOURTH QUARTER	
Algebra II.....	4	Algebra IV.....	4
Geometry II.....	5	Mechanism.....	4
Preparatory Rhetoric I.....	5	Descriptive Geometry II.....	4
Mechanical Drawing II.....	4	Graphic Statics.....	4
Physics I.....	4	Trigonometry I.....	5

DESCRIPTION OF COURSES. MATHEMATICS

1. **College Algebra I.:** Special stress is laid on factoring, radical quantities, fractional exponents, the solution of simple equations of one, two or more unknown quantities and the quadratic of one unknown. Text: Wells. Prerequisite: Alg. I., II. and III.

2. **College Algebra II.:** The large part of this course is a study of the quadratic equation, followed by the surds, the imaginaries, the binomial theorem and arithmetical, geometrical and harmonic series. Text: Wells. Prerequisite: College Alg. I.

3. **College Algebra III.:** An exposition of the theory of logarithms; permutation combinations, choice and chance, determinants; theory of equations. Text: Wells. Prerequisite: College Alg. II.

4. **Trigonometry I.:** Plane. This course includes the theory of the trigonometric functions and their application to the solution of right and oblique triangles; the use of tables; the solution of a large number of practical problems. Text: Granville. Prerequisite: Alg. III. or High School equivalent.

5. Trigonometry II.: Gives attention to the solution of trigonometric identities, the solution of trigonometric equations and the theory and solution of special triangles. Text: Granville. Prerequisite: Trig. I.

6. Analytical Geometry I.: The properties of the straight line, the circle, and the parabola. Text: Riggs. Prerequisite: Trig. I.

7. Analytical Geometry II.: The ellipse, the hyperbola, the discussion of the higher plane curves and solid analytical geometry. Text: Riggs. Prerequisite: Analytics I.

8. Calculus I.: Differential Calculus, differentiation of functions; applications of the derivatives; maxima and minima of functions. Text: Davis. Prerequisite: Analytics I.

9. Calculus II.: Infinite Series. Curvature of curves; evolutes and involutes; curve tracing; infinite series; integration. Text: Davis. Prerequisite: Calculus I.

10. Calculus III.: Integral Calculus. Indefinite integration, and the application of integral calculus to the solution of practical problems. Text: Davis. Prerequisite: Calculus II.

11. Differential Equations: Solution of problems of the first and second degree. Text: Johnson. Prerequisite: Calculus III.

12. Analytical Mechanics: In order to prepare for the more technical studies of Mechanics of Materials and Applied Mechanics, a course in the principles of Mechanics is given. The text-book is supplemented with original problems so as to get the student into the habit of analyzing these problems and using his own methods of solution. Text: Maglott. Prerequisites: Calc. I.

13. Applied Mechanics: Centroids of areas; moments of inertia; motion in a straight line; curvilinear motion; combined rotation and translation; dynamics of machinery; work and energy; friction; impact. Text: Hancock. Prerequisite: Calculus III.

PHYSICS AND CHEMISTRY

4 Physics IV.: (University Physics—Mechanics): Kinematics, kinetics elasticity, mechanics of fluids, lectures, class exercises and laboratory work. Prerequisites: Physics I., II., and III. and Calculus I.

5. Physics V.: (University Physics—Sound, Heat and Light); Nature and motion of sound, theory of music, nature and propagation of light, refraction, reflection, dispersion and polarization, nature of heat, temperature, expansion, fusion, kinetic theory of gases. Text: Carhart's University Physics. Prerequisites: Same as in Physics IV.

6. Physics VI.: (University Physics—Magnetism and Electricity): Electrical charges, potential capacity, electrolysis, Ohm's law, electrodynamics electromagnetism, electro-magnetic induction, electric oscillations. Lectures and class exercises. Text: Carhart's University Physics. Prerequisites: The same as in Physics IV.

7. Chemistry II.: This is a course in the non-metallic elements and their inorganic compounds. The class work consists of lectures, recitations and demonstrations. In individual laboratory work, each student thoroughly investigates every subject. Text: McPherson and Henderson Prerequisite: Physics I., II., III., Algebra 1.

8. Chemistry III.: In this course the metallic elements, their compounds and chemical philosophy are theoretically and practically taught by lectures, recitations, demonstrations and much individual laboratory work by the student. Text: McPherson and Henderson Prerequisite: Chemistry II.

DRAWING.

1. Freehand Drawing: Sketching and pencil work.
2. Lettering: Freehand engineering lettering.

3. Mechanical Drawing: Use of drawing instruments, cabinet and isometric projections, working drawings. Text: French's Engineering Drawing. Prerequisite: Freehand Drawing, geometry, lettering.

4. Projections: Orthographic projections, intersections, shadows, elementary linear perspective. Text: French's Engineer Drawing. Prerequisite: Mechanical Drawing.

5. Perspective: Angular, parallel, vertical, curvilinear and perspective shades and shadows. Text: Ware's Modern Perspective. Prerequisite: Projections.

6. Descriptive Geometry I.: Advanced orthographic projection planes, single and double curved surfaces. Text: Church's Descriptive Geometry. Prerequisite: Projections.

7. Descriptive Geometry II.: Spherical projections, maps, shadows, perspectives. Text: Church's Descriptive Geometry. Prerequisite: Descriptive Geometry I.

8. Machine Drawing: Drafting room practice, conventions, detailing, assembly drawings, checking. Text: Reid's Machine Drawing and Elementary Machine Design. Prerequisite: Descriptive Geometry I.

9. Machine Design I.: (Kinematics of Machinery): Velocity diagrams, gears, cams, couplings, straight line and parallel motions. Text: Jones' Machine Design, Part I. Prerequisites: Machine Drawing, Mechanics I.

10. Machine Design II.: Form, strength, proportions, bearings, gears, shafts, couplings, fly-wheels, cylinders. Text: Jones' Machine Design, Part II. Prerequisites: Machine Design, Part I., Mechanics of Materials I.

11. Masonry Design: Intersecting arches, warped surfaces, etc., modeling and drawing. Text: Professor's Notes. Prerequisite: Descriptive Geometry.

CIVIL ENGINEERING

1. Plain Surveying: Chain, compass, level and transit use. Text: Pence and Ketchum's Manual of Surveying. Prerequisite: Trigonometry.

2. Field Engineering: Land, topographical, stadia and city surveying. Drawing room—platting, blue printing and tinting. Text: Professor's Notes. Prerequisite: Plane Surveying.

3. Railroad Surveying: Reconnaissance, preliminary and mathematics of curves. Text: Searle's Field Engineering. Prerequisite: Field Engineering.

4. R. R. Economics and Design: Location, maintenance, and economics. Text: Wellington's Economic Theory of Railway Location and Talbot's Transition Curves. Prerequisite: Railroad I.

5. Highway Engineering: Location and construction of streets and pavements. Text: Baker's Roads and Pavements. Prerequisite: Field Engineering.

6. Structural Geology: A study of the earth's crust, dealing with rock form and structure, and the formation of mineral deposits and mountains. Text: Chamberlain and Salisbury. Prerequisites: Physical Geography, Chemistry and Physics.

7. Sewerage: Disposal and design. Text: Fowell's Sewerage. Prerequisites: Chemistry and Surveying.

8. Irrigation: History, methods of installation, cost. Text: Bowie's Irrigation. Prerequisites: Physics and Sewage.

9. Hydraulics I.: Hydrostatic and hydromechanic pressures. Text: Merriman's Hydraulics. Prerequisites: Physics and Calculus.

10. Hydraulics II.: Hydraulic machinery. Text: Merriman. Prerequisite: Hydraulics I.

11. Least Squares: Its relation to Engineering. Text: Merriman's

Method of Least Squares. Prerequisites: Calculus, Mechanics.

12. **Astronomy:** Study of the celestial spheres. Text: Young's Manual of Astronomy. Prerequisite: Calculus.

13. **Field Astronomy:** Observation and computation. Text: Comstock. Prerequisite: Astronomy.

14. **Geodesy:** Geodetic surveying and map making. Text: Merriman. Prerequisite: Least Squares.

15. **Masonry:** Properties and uses of sand, brick, lime and cement. Text: Baker's Masonry Construction. Prerequisites: Stereotomy, Mechanics.

16. **Foundation and Retaining Walls:** Foundations, dams, retaining walls, culverts, arches. Text: Baker. Prerequisite: Masonry.

17. **Mechanics of Materials I. and II.:** The course in Mechanics of Materials takes up work in elastic and ultimate strength of materials and treats of the simple stresses which may come upon materials. This is followed by elastic and ultimate deformations. This carries the student into a further discussion of the resistance and elasticity of materials, the theory of beams, continuous girders, columns and shafts. The course also includes a discussion of the resilience, combined and true stresses, and elements of the mathematical theory of elasticity. Text: Merriman's Mechanics of Materials. Prerequisites: Higher Mathematics.

18. **Stresses I. and II.:** Roofs and bridges. Text: Merriman's Bridge I. Prerequisites: Higher Mathematics and Mech., of Mat.

19. **Graphics I. and II.:** Roofs and bridges. Text: Merriman's Bridge II. Prerequisite: Higher Mathematics.

20. **Higher Structures:** Cantilevers, swing bridges, arches, suspension bridges. Text: Merriman's Bridge IV. Prerequisite: Stresses and Graphics.

21. **Bridge Design I.:** Roofs, trusses and plate girder bridges. Text: Merriman's Bridge III. Prerequisites; Stresses and Graphics.

22. **Bridge Design II.:** Complete design of simple trusses and special bridges. Text: Professor's Notes. Prerequisites: Bridge Design I.

23. **Building Construction:** Computation of Stresses and Design of modern structures. Text: Ketchum's Mill Buildings. Prerequisites: Stresses and Graphics.

24. **Reinforced Concrete:** Bridges, buildings, and kindred structures. Text: Taylor and Thompson. Prerequisites: Calculus, Masonry.

25. **Cement Laboratory:** Test for fineness, specific gravity, time of set, tensile and compressive strength, et cetera. Text: Waterbury. Prerequisites: Masonry.

26. **Water Supply:** Design, construction, maintenance. Text: Folwell. Prerequisite: Physics and Field Engineering.

27. **Hydraulic Laboratory:** Test for water transportation losses. Text: Professor's Notes. Prerequisite: Hydraulics I. and II.

ELECTRICAL ENGINEERING

1. **Elementary Electrical Engineering:** Lectures, Problems, and Laboratory work in electrical measurements. Prerequisite: Physics VI.

2. **Electric Machinery I.** (D. C. Generators).: Physical theory, construction, reactions, windings. Text: Sheldon's Dynamo Machinery, Vol. I. Prerequisites: Elements, Calculus I. Physics VI.

3. **Electric Machinery II.:** (D. C. Motors, Regulators, Balances): Theory and Construction. Text: Sheldon's Dynamo Machinery, Vol. I. Prerequisite: Electric Machinery I.

4. **Electric Machinery III.:** (D. C. Laboratory): Experimental work with direct currents and D. C. apparatus. Prerequisite: Electric Machinery I. and II. Text: Caldwell's Exper. Elect. Eng.

5. **Electric Machinery IV.:** (D. C. Machine Design).: Practical design of a D. C. generator. Text: Gray's Electrical Machine Design.

COLLEGE OF ENGINEERING

Prerequisite: Electric Machinery I. and II.

6. **Electric Machinery V.:** (A. C. Generators): Theory, construction, windings. Text: Sheldon's Dynamo Machinery. Vol. II. Prerequisite: Electric Machinery I. and II.

7. **Electric Machinery VI. (Transformers):** Theory, construction, design. Texts: Sheldon's Dynamo Machinery, Vol. II., Taylor's Alternating Current Transformers. Prerequisite: Electric Machinery V.

8. **Electric Machinery VII.:** (A. C. Motors, Synchronous and Induction): Theory, construction, diagrams, design. Text: Bailey's Induction Motors, Sheldon's Dynamo Machinery, Vol. II. Prerequisite: Electric Machinery VI.

9. **Electric Machinery VIII.:** (A. C. Design): Design of an A. C. Generator. Text: Gray's Electrical Machine Design. Prerequisite: Electric Machinery V.

10. **Electric Machinery IX.:** (A. C. Laboratory): Prerequisite: Electric Machinery VI. and VII. Text: Caldwell's Exper. Elec. Eng.

11. **Alternating Currents:** Advanced Theory, lectures, recitations and laboratory. Text: Bedell and Crehore. Prerequisite: Electric Machinery V.

12. **Electric Railways:** Probable earnings, surveys, construction, operating expenses, car barns. Texts: Harding's Electrical Railway Practice, Gotscall's Electric Railway Economics, Current Periodicals. Prerequisite: For C. E. students, Elementary Elect. Eng. For E. E. students, Elect. Machines VI. and VII.

13. **Electrical Transmission of Energy:** Circuits, losses, tests circuit design. Text: Abbott's Electrical Transmission of Energy. Prerequisite: For E. E. students, Elect. Machines VI. and VII.

14. **Electric Meters (D. C. and A. C. Meters):** Theory, construction, calibration. Prerequisite: Electric Machinery V. Text: Edgecumbe's.

15. **Storage Batteries:** Theory, construction. Prerequisites: Chemistry II., Electric Machinery I. Text: Lyndon's Storage Batteries.

16. **Telephone Engineering:** Circuits, apparatus, central office equipment, cable plant. Testing. Prerequisite: Electrical Machine I. Text: Telephonogy.

17. **Illuminating Engineering:** Theory and general principles, Photometry, calculation of Illumination. Text: Wicenden's Illumination and Photometry. Prerequisites: Physics V., VI.

18. **Electric Power Plant Engineering:** Power Plant layouts, switch gear operation of plants. Text: Weingreen. Prerequisite: Physics VI.

MECHANICAL ENGINEERING

1. **Thermodynamics. I.** Theory of heat, laws of dynamics, perfect gases saturated vapors, superheated vapors. Text: Cardullo's Thermodynamics. Prerequisites: Calculus II., First Year Physics.

2. **Thermodynamics II:** Steam engines, compound engines, engines testing, engine economy. Text: Cardullo's. Prerequisite: Thermodynamics. I.

4. **Steam Boilers and Boiler Design:** Structure, design, fuels, heating surface, boiler trials. Text: Thurston's Manual of the Steam Boiler. Prerequisites: Thermodynamics, Machine Design II.

5. **Steam Power Plants:** Plant layouts, plant testing, economy, design. Text: Myer's Steam Power Plants. Prerequisites: Steam Boilers. Thermodynamics II.

6. **Steam Turbines:** Velocity and flow of steam, flow of steam through orifices, turbines, reaction turbines, impulse-reaction turbines. Text: Moyer's Steam Turbines. Prerequisite: Thermodynamics.

7. **Gas Engines:** Liberation of heat energy, combustion, gas engines burning gas, gas engines using kerosene oil, gas engines using gasoline,

automobile engines, ignition, carburation testing. Text: Jones' The Gas Engine. Prerequisite: Thermodynamics II. Organic Chemistry I.

8. Mechanical Lab. I.: Laboratory work in heat measurements, Boiler Tests. Text: Moyer's Power Plant Testing. Prerequisite: Thermodynamics II.

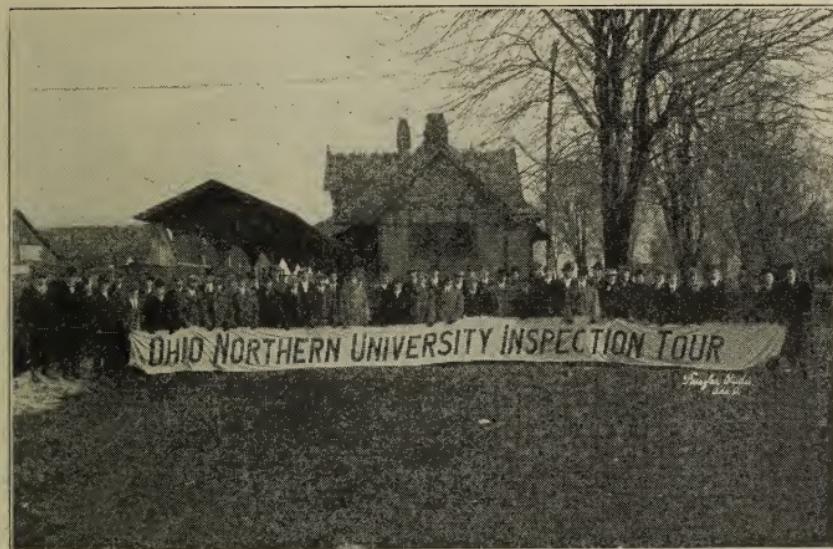
9. Mechanical Lab. II.: Steam and Gas Engine Tests, Power Plant Test, Problems. Text: Moyer's Power Plant Testing. Prerequisite: Gas Engines.

10. Gas Engine Design: Calculations and assembly drawing. Text: Lucke and Kent's hand-book. Prerequisite: Gas Engines. Machine Des. II., Applied Mechanics.

11. Scientific Management: Factory organization, management, etc.

12. Machine Theory: To become familiar with machines. Text: Halsay's Machine Theory.

13. Machine Shop Practice: Text: American Machinist's Hand book and Notes.



ANNUAL INSPECTION TOUR

Although the students are taken to nearby manufacturing industries at stated intervals during their course, yet the Senior Class as a whole devotes one week to an extended visit to some large commercial center. This year's class invaded the Chicago District, when every minute was profitably spent in the study of the various phases of engineering practice. Each department is accompanied by one of its professors, and has its own itinerary. The cost of this trip is nominal, as advantage is taken of party

rates wherever possible. Next year's class will spend the week of Feb. 26-Mar. 3 among the industries of Niagara Falls and vicinity.

OUR GRADUATES

Our graduates are our greatest advertisements, and the phenomenal growth of our school in the past few years is largely due to their hearty support. We are continually receiving letters from graduates who are now filling most responsible positions. Hundreds of these grace our files and while heretofore it has been our policy to publish a few of them to demonstrate to the prospective student what many of our boys have been able to accomplish and the responsible positions held by them, yet owing to lack of space accruing from new features added to this issue of the Bulletin we are unable to present any of them.

NEW BUILDINGS

The Ohio Northern University has fine, new up-to-date buildings:

The Dukes Memorial, with commodious class rooms, offices, and laboratories, devoted to science, mathematics, engineering, and agriculture.

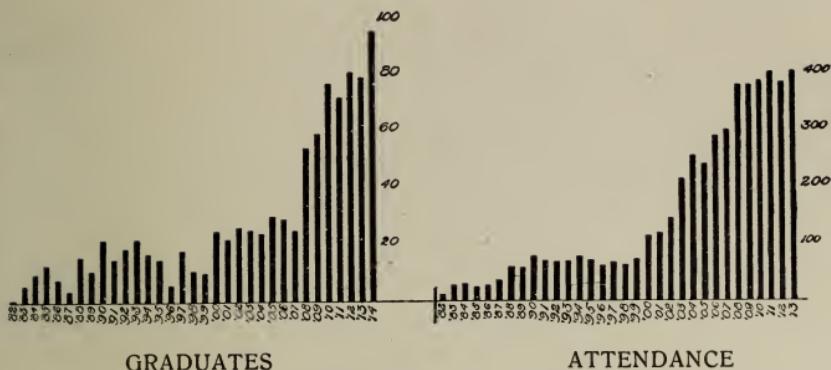
The Lehr Memorial, dedicated Thursday, May 27, 1915, in which are located the executive offices, the Y. M. and Y. W. C. A. rooms, the library with reading and research rooms, the apartments of the College of Commerce, College of Law, and a magnificent auditorium seating 1600 people.

The Hill Memorial, completed the past year, contains ten recitation rooms, two literary societies, electrical and mechanical laboratories, and the central heating and lighting plant. In this new and magnificent building is the department of language, history, philosophy, and College of Education.

The Music Hall, nearly new has assembly room, studios, offices, and many private practice rooms.

The Pharmacy Building, recently remodeled with large laboratories, recitation rooms and Adelphian Literary society, is an attractive and valuable building.

The Brown Memorial, soon to be fitted up for a gymnasium with equipment to put it in first class shape for indoor athletics and Military drill.



The above diagram represents the growth of the College of Engineers since 1881.

SUMMARY (1915)

GRADUATES

Civil	34
Electrical	17
Mechanical	12
Architecture	1

UNDERGRADUATE

Civil	147
Electrical	102
Mechanical	52
Municipal and Sanitary	3
Architecture	7
Mining	4

POSITIONS

Our experience in the past has been that the demand made upon the College of Engineering for graduates has been far in excess of the supply. Many employers insist on us granting concessions whereby our men can get away at the very earliest moment to report for duty. The question is asked us sometimes whether we guarantee to secure positions for our graduates. This question we must answer in the negative, as no responsible school can afford to make such a guarantee.

There is not to our knowledge, a single graduate (since the department was founded) that is not holding a good position.

This is certainly ample proof to the most skeptical that our Institution is worthy of patronage.

UNIVERSITY BULLETIN

Published in June, July, September, November, January, April and May by the Ohio Northern University, Ada, Ohio. Entered as second-class matter July 3, 1907, at the postoffice at Ada, Ohio, under the Act of Congress on July 16, 1894.

CLASS OF 1916

Judson, Harry R President
 Evans, William T. Vice President

Brewer, Paul P. Secretary
 Smith, Leslie P. Treasurer

CIVIL

Allen, Albert R. Copenhagen, N. Y.
 Brewer, Paul P. Chillicothe, O.
 Boyle, Earl F. Gouverneur, N. Y.
 Bloise, Jose, Jr.
 Guyamala, Porto Rico
 Campbell, Ivor S. Arlington, N. J.
 Cleavenger, Bruce J.
 Spencer, W. Va.
 d'Avilla, Edgard Sileira
 Rio Janeiro, Brazil
 Elbin, Guy P. Clearville, Pa.
 Estrada, Manuel Havana, Cuba
 Evans, Otis S. Booneville, N. Y.
 Gardner, Loyde H. McLean, Ill.
 Gertler, David B. New York, N.Y.
 Hibbs, Arthur S. Akron, O.
 Hill, Joseph H. Greenville, Florida
 Hayden, John E. Athol, Mass.
 Linder G. Earl Sharon, Pa.

Larson, Theodore ... Brooklyn, N. Y.
 Marshall, Craig W. Omaha, Neb.
 Plant, Arthur F. Newark, N. J.
 Penny, Frank C. Westport, Conn.
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 Smith, Robert L. Sidney, O.
 Schauwecker, Harry C. Nevada, O.
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 Rio Janeiro, Brazil
 Thevenet, Edward H. Newark, N.J.
 Tavares Jayme Natal, Brazil
 Yim, Sung Jow. San Francisco, Cal.

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 Walter, Carlss Cherry Creek, N. Y.

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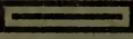
Wright, Lauren R. N. Girard, Pa.



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